



Original Research Article

Study of Haematological Profile and Body Mass Index in Undergraduate Medical Students in Lucknow, Uttar Pradesh

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Received: 17/04/2015

Revised: 23/04/2015

Accepted: 19/05/2015

ABSTRACT

In view of ever increasing burden of anaemia in India and its detrimental effects on academic performance of students it is necessary to find out the prevalence in undergraduate college students. Present study was conducted in 200 Undergraduate Medical Students.

Data of Haemoglobin gm/dl (Sahli's Method), TRBC and Blood Indices (MCV femtolitres, MCH pictograms, MCHC gm/dl) and BMI (Kg/m²) was analysed and students were grouped into anaemic and non anaemic group. Further grading of anaemia and BMI was done as per the WHO criterion.

Results were analysed using SPSS. Correlation between BMI and Hb was estimated. The results showed that overall 10% (20/200) students were overweight and 49/200 i.e. 24.5% were underweight which meant that 69/200 i.e. 34.5% were malnourished. In our present study anaemia was found in 22/49(44.9%) underweight (44.9%) and 2/20 (10%) overweight subjects which meant that 24/69(34.78%) anaemic subjects were malnourished. There was a significant correlation of BMI with Hb in males($r=-0.203$, $p=0.03$) but in females there was non significant negative correlation($r=-0.024$, $p=0.82$).

Results showed that 23.67 % normal BMI subjects were anaemic. There was significant difference between Hb ($p<0.001$), TRBC (<0.001) and MCHC(<0.05) between males and females. There was significant difference ($p<0.05$) between mean BMI (Kg/m²) of males (21.87±2.94) and females(19.17±2.11). There was significant differences between the Hb, MCV, MCH, MCHC levels of anaemic and non anaemic subjects in both males and females. In conclusion there is a correlation between BMI and Hb status, anaemia is more prevalent in female college students and the problem of anaemia should be addressed seriously.

Key words: Haematological profile, Haemoglobin, Anaemia, BMI.

INTRODUCTION

Anaemia remains a major public health problem. Nutritional Anaemia is common amongst adolescents and young adults ⁽¹⁾ and is a major public health problem in India. ⁽²⁾ It is estimated that 1.62

billion (24.8% population) people globally, 50% women of reproductive age group and 26% males between age group 15-59 years are suffering from anaemia. ⁽³⁾ Human Resource Development depends upon the nutrition because physical, mental health

and work capacity is effected by malnutrition. ⁽⁴⁾ Nutritional deficiencies leading to anaemia could have detrimental effect on health on future doctors and health care providers of India. Moreover with doctor patient ratio of 1:1700 in India the issue becomes even more critical. ⁽⁵⁾ Previous studies have highlighted the relation between anaemia and body composition. ⁽⁶⁾ Thus, present study was undertaken to find out the status of anaemia and correlation of BMI with Hb in Undergraduate MBBS Students. BMI values of 18.5-24.99 Kg/ m², < 18.5 Kg/ m² and > 25 Kg/m² were taken as normal, underweight and overweight respectively as per WHO. ⁽⁷⁾

MATERIALS AND METHODS

The present cross sectional study was conducted on 200 First and Second year undergraduate MBBS students of Integral Institute of Medical Sciences & Research, IIMS&R, Integral University, Lucknow. The data of following parameters was analysed:

1. Haemoglobin Levels (gm/dl) were estimated using Sahli's method.
2. TRBC: A known volume of blood is diluted 200 times with a fluid (Hayems fluid) which is isotonic with blood using RBC pipette. Red cells in the diluted blood are counted with the help of a improved Neubauer chamber and red blood cell in the undiluted blood per cmm($n \times 10,000$) is calculated.
3. Blood Indices: MCV($\text{Hct} / \text{RBC} \times 10$), MCH($\text{Hb gm/dl} / \text{RBC} \times 10$), MCHC($\text{Hb gm/dl} / \text{Hct} \times 100$). Normal values of MCV, MCH and MCHC are 80-96 femtoliters, 27-32 picogram and 32-36 gm/ dl respectively.
4. BMI(Kg/m²)

The students were classified into anaemic and non anaemic groups as

per the WHO cut off values and further grading was done on the basis of severity of anaemia. Data was analysed using SPSS 19.0 by applying Student's t test and Chi Square test. Correlation between BMI and Hb was seen by applying Pearson Correlation test. p value of < 0.05 was taken as significant.

RESULTS AND OBSERVATIONS

BMI, Hb, TRBC and blood indices data of 200 MBBS students (109 males and 91 females) was analysed. The results showed that 145 students (72.5%) were having Hb levels within the normal range. Fifty Five (27.5%) were found to be anaemic as per the cut off values defined by WHO (Table 1). Gender wise amongst males 89(81.65%) and 20(18.35%) were found to be non anaemic and anaemic respectively. Similarly, 56(61.54%) and 35 (38.46%) females were found to be non anaemic and anaemic respectively. Grade wise distribution showed that 18.35% (20/109) males were having mild anaemia. Amongst females 35.16% (32/91) and 3.30% (3/91) were having mild and moderate grade anaemia respectively.

The statistical analysis showed a significant relation between normal and anaemic status [$p < 0.001$] (Table 2). The mean Hb(gm/dl), MCV(femtoliters), MCH(pictogram), MCHC(gm/dl), TRBC(million/mm³) was 14.97±1.85, 83.66±8.70, 29.66±3.72, 35.64±4.40, 5.07±0.51 and 12.86±1.70, 80.95±7.09, 28.81±4.00, 35.71±4.71, 4.48±0.40 in males and females respectively. There was significant difference between Hb ($p < 0.001$), TRBC(< 0.001) and MCHC(< 0.05) between males and females. There was significant difference ($p < 0.05$) between mean BMI(Kg/m²) of males(21.87±2.94) and females(19.17±2.11) (Table 3). Table 4

shows that there is significant differences between the Hb, MCV, MCH, MCHC levels of anaemic and non anaemic subjects in both males and females.

Analysis of BMI of all 200 students show that 69/200 ie 34.5% are malnourished. Out of 109 males 81(74.31%), 11(10.09%),17(15.60%) and out of 91 females 50(54.94%),38(41.76%),3(3.30%) were found to be normal, underweight and overweight as per BMI Grading(table 5). Out of 20 total male anaemic students 14(70%), 4(20%) and 2(10%) were normal, underweight and overweight respectively. Out of 35 anaemic females 17(48.57%) were normal and 18(51.43%) were underweight as per BMI Grade (table 6). Mild anaemia was found in 27(49.09%), 23(41.82%) and 2(3.64%) normal, underweight, overweight subjects respectively and moderate anaemia was found in 3(5.54%) subjects having normal BMI (table 7).There was a significant correlation of BMI with Hb in

males($r=-0.203$, $p=0.03$) but in females there was non significant negative correlation($r=-0.024$, $p=0.82$)[table 8].

Table 1: Gender Wise Distribution of Anaemia

Status	Male		Female	
	Number	%	Number	%
Non Anaemic	89	81.65	56	61.54
Anaemic	20	18.35	35	38.46
Total	109	100	91	100

Table 2: Grade Wise Distribution

Grade	Male		Female	
	Number	%	Number	%
Normal	89	81.65	56	61.54
Mild	20*	18.35	32**	35.16
Moderate	00	00	03***	3.30
Severe	00	00	00	00
Total	109	100	91	100

P <0.001.*100% anaemic males were having mild anaemia.**91.43% and ***8.57 % anaemic females were having mild and moderate anaemia respectively.

Table 3: Haematological Profile and BMI

Parameter	Male	Female	p value
Hb(gm/dl)*	14.97±1.85	12.86±1.70	<0.001
MCV	83.66 ±8.70	80.95±7.09	NS
MCH	29.66±3.72	28.81±4.00	NS
MCHC*	35.64±4.40	35.71±4.71	<0.05
TRBC*	5.07±0.51	4.48±0.40	<0.001
BMI*	21.87±2.94	19.17±2.11	<0.001

*significant difference

Table 4: Comparison between anaemic and non anaemic subjects

Parameter	Males			Females		
	Anaemic n=20	Non Anaemic n=89	p	Anaemic n=35	Non Anaemic n=56	p
Hb	12.04±0.74	15.63±1.30	<0.001	11.13± 0.93	13.93±1.05	<0.001
TRBC	4.90±0.52	5.10±0.50	NS	4.35±0.35	4.56±0.40	0.01
MCH	25.69±2.59	30.77±2.98	<0.001	24.76±2.57	30.76±3.47	<0.001
MCHC	30.93±2.60	38.69±2.93	<0.001	28.67±1.76	37.20±3.09	<0.001
MCV	83.01±8.39	86.59±9.66	<0.001	79.54±7.04	83.20±6.68	0.01
BMI	21.78±2.97	22.29±2.85	NS	18.89±2.14	19.35±2.09	NS

Table 5: BMI Status (n=200)

BMI	Males		Females	
	Number	%	Number	%
Normal	81	74.31	50	54.94
Underweight	11	10.09	38	41.76
Overweight	17	15.60	03	3.30
Total	109	100	91	100

P<0.001. Overall 10% (20/200) students are overweight and 49/200 ie 24.5% are underweight. 69/200 ie 34.5% are malnourished.

Table 6: Anaemia in different grades of BMI (n=55)

BMI	MALES(n=20)		FEMALES(n=35)	
	Number	%	Number	%
Normal	14	70	17	48.57
Underweight	04	20	18	51.43
Overweight	02	10	00	00
Total	20	100	35	100

P=0.021.22/49 underweight are anaemic (44.9%) and 2/20 (10%) overweight are anaemic. 24/69(34.78%) malnourished are anaemic. Similarly, 31/131(23.67%) normal weight are anaemic.

Table 7: Anaemia in different grades of BMI in Anaemic Students (n=55)

Anaemia Status	BMI					
	Normal		Underweight		Overweight	
	Number	%	Number	%	Number	%
Mild	27	49.09	23	41.82	02	3.64
Moderate	03	5.45	00	00	00	00

P<0.05

Table 8: Correlation of BMI with Hb

Male		Females	
r	p	r	p
-0.203	0.03	-0.024	0.82

DISCUSSION

Anaemia is a major public health problem in India. ⁽²⁾ Nutritional status is a major determinant in anaemia. Deficiency of one or more nutrients required for haemopoiesis results in below normal average concentration of Haemoglobin which in turn leads to nutritional anaemia. ⁽⁸⁾ Malnutrition as such can have negative consequences on health. A careful analysis of data in our study shows that overall 10% (20/200) students are overweight and 49/200 i.e. 24.5% are underweight which means that 69/200 i.e. 34.5% are malnourished. In a large multi-centric study done in both male and females (10-25 years age group) malnutrition was reported in 35.4% students. It was concluded that nutritional status plays an important role in the academic performance. ⁽⁹⁾ Though sample size in our study is small and we have not correlated academic performance with nutritional status but still the results assume importance because in light of ever increasing changes in examination and evaluation patterns, healthy students are more likely to cope with the challenges and sustain performance.

In our present study anaemia was found in 22/49(44.9%) underweight and 2/20 (10%) overweight subjects which meant that 24/69(34.78%) anaemic subjects were malnourished. There was a significant correlation of BMI with Hb in males($r=-0.203$, $p=0.03$) but in females there was non significant negative correlation($r=-0.024$, $p=0.82$). Saxena et al ⁽¹⁰⁾ reported negative correlation between BMI and Hb status in medical students. Other studies have reported no significant correlation between BMI and Hb status. ⁽¹¹⁾ Moreover various data have shown that there is association between BMI and anaemia and anaemia

decreases with increase in nutritional status. ^(1,12) In our study 23.67 % normal BMI subjects were anaemic. The possible explanation could be lifestyle, dietary habits and the fact that anaemia results both from nutritional and non nutritional causes. We have not explored the reasons of anaemia in normal BMI subjects but anaemia in normal BMI female subjects could possibly be attributed to menstrual irregularities (though we have not included the menstrual history). Many studies have reported relation between anaemia and menstrual irregularities in females. ^(13,14)

In our study 2/20 (10%) overweight subjects were found to be anaemic. Recent researches have highlighted the role of Hepcidin (mediator of inflammation which is up-regulated in obesity) mediated inhibition of dietary iron absorption which in turn leads to anaemia. ⁽¹⁵⁾ In our present study 3.3 % (3/91) female subjects were overweight but none were anaemic which could be attributed to the fact that iron stores of obese women are higher than non obese women. ⁽¹⁶⁾ 41.76 % (38/91) female students were found to be underweight and out of total 35 anaemic females 18(51.43%) were underweight. Results of study done by Patil S N et al showed that anaemia was prevalent in 41 % adolescent girls and 2/3 were underweight. ⁽¹⁷⁾

Our results showed significant differences between the Hb, MCV, MCH, MCHC levels of anaemic and non anaemic subjects in both males and females. A study done by Manjula V D et al showed that Hb, MCH, MCV, MCHC were significantly low in anaemic subjects as compared to non anaemic subjects. ⁽¹⁸⁾

CONCLUSIONS

There is a correlation between BMI and Hb status. Anaemia is more prevalent in female undergraduate students. The issue of

nutritional deficiencies in college students should be addressed.

Improvements in the study: Inclusion of dietary habits, menstrual history in females and analysis of iron stores will yield better results.

ACKNOWLEDGEMENT

Authors are thankful to all the participants in the study and wish them a bright, healthy and malnutrition free future.

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How to cite this article: Waseem Shah MA, Bano R, Ahmad N et. al. Study of haematological profile and body mass index in undergraduate medical students in Lucknow, Uttar Pradesh. Int J Health Sci Res. 2015; 5(6):257-262.

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